

# Work Order ID 124830

**\*124830\***

Page 1

Wednesday, September 24, 2014 9:23:42 AM

Item ID: D412-664-203TRN

Accept

**\*N900040100\***

Setup Start **\*NS1\***

Revision ID:

Stop **\*NS2\***

Item Name: Crosstube Turning Detail

Start Date: 9/24/2014 Start Qty: 1.00

**\*1\***

Cust Item ID:

Required Date: 9/24/2014 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: MLJ

Date: 14-09-24

Tooling:

Date:

Run Start **\*NR1\***

QC:

Date:

SPC (Y/N):

Date:

Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
Draw Nbr	Revision Nbr								
D412-664-243	F								

100

0.00

**\*100\***

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Fill tube with sand & install plugs DT8534 on both ends as per Folio FA166

2-Turn first side as per Folio FA166

3- File transition lines smooth.

FOLIO REV: 1

DWG REV: 1

1 / 14/10/02

110

QC1- Inspect dimensions to dimension sheet

0.00

**\*110\***

QC

Memo

0.00

Quality Control

1 / 14/10/02

**Work Order ID 124830**

Wednesday, September 24, 2014 9:23:42 AM

**\*124830\***

Page 2

Item ID: D412-664-203TRN

Accept

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Setup Start

**\*NS1\***

Revision ID:

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Item Name: Crosstube Turning Detail

Start Date: 9/24/2014 Start Qty: 1.00

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Cust Item ID:

Required Date: 9/24/2014 Req'd Qty: 1.00

**\*1\***

Customer:

Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_

Run Start

**\*NR1\***

QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_

Stop

**\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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120

0.00

**\*120\***

MORI SEIKI CNC LATHE LARGE

Mori Seiki

Memo

0.00

Mori Seiki CNC Lathe Large

1-Turn second side as per Folio FA166  
2- File transition lines smooth.  
3- Remove sand and plugs  
4-Scribe part # and batch # using vibrating stylus  
FOLIO REV: AA  
DWG REV: f

1 0  
mgr 2  
14/10/06

130

QC1- Inspect dimensions to dimension sheet

0.00

**\*130\***

QC

Memo

0.00

Quality Control

+ PERFORM ULTRA SONIC MEASUREMENT

1 0  
mgr 2  
14/10/06

140

QC8- Inspect parts - second check

0.00

**\*140\***

QC

Memo

0.00

Quality Control

+ CHECK ULTRA SONIC MEASUREMENT AND ORIENTATION FOR  
BENDING

14-10-20

# Work Order ID 124830

Wednesday, September 24, 2014 9:23:42 AM

**\*124830\***

Page 3

Item ID: D412-664-203TRN Accept **\*N900040100\*** Setup Start **\*NS1\***  
 Revision ID: Stop **\*NS2\***  
 Item Name: Crosstube Turning Detail  
 Start Date: 9/24/2014 Start Qty: 1.00 **\*1\*** Cust Item ID:  
 Required Date: 9/24/2014 Req'd Qty: 1.00 **\*1\*** Customer:  
 Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_ Run Start **\*NR1\***  
 QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_ Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
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145		0.00							
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**\*145\***

Crosstubes

Memo

0.00

Crosstubes

GRIND ONLY TRANSITION LINES SMOOTH LONGITUDE WAY.

*JW* 14.10.21

150		0.00							
-----	--	------	--	--	--	--	--	--	--

**\*150\***

HandFXtube

Memo

0.00

Hand Finishing Crosstubes

1- PRESSURE WASH X-TUBE INSIDE AND OUT

2- ACID ETCH X-TUBE INSIDE AND OUT. USE RED SCOTCH BRITE

*BC* 14/10/29

160	QC5- Inspect part completeness to step on W/O	0.00							
-----	---	------	--	--	--	--	--	--	--

**\*160\***

QC

Memo

0.00

Quality Control

DAS  
38  
9-89

*l*

DAS  
49  
9-89  
14/10/30

# Work Order ID 124830

Wednesday, September 24, 2014 9:23:42 AM

**\*124830\***

Page 4

Item ID: D412-664-203TRN Accept **\*N900040100\*** Setup Start **\*NS1\***  
Revision ID: Stop **\*NS2\***  
Item Name: Crosstube Turning Detail  
Start Date: 9/24/2014 Start Qty: 1.00 **\*1\*** Cust Item ID:  
Required Date: 9/24/2014 Req'd Qty: 1.00 **\*1\*** Customer:  
Reference:

Approvals: Process Plan: \_\_\_\_\_ Date: \_\_\_\_\_ Tooling: \_\_\_\_\_ Date: \_\_\_\_\_ Run Start **\*NR1\***  
QC: \_\_\_\_\_ Date: \_\_\_\_\_ SPC (Y/N): \_\_\_\_\_ Date: \_\_\_\_\_ Stop **\*NR2\***

Sequence ID/ Work Center ID	Operation Description	Set Up/ Run Hours	Tool ID	Tool #	Plan Code	Accept Qty	Reject Qty	Reject Number	Insp. Stamp
170	Packaging	0.00				1			DAS 47 9-89 JW 14-10-30
<b>*170*</b>	Memo	0.00							
Packaging	Identify and stock in kanban rack Location: <u>LG</u>								
180	QC21- Final Inspection - Work Order Release	0.00							14/11/3 DJ
<b>*180*</b>	Memo	0.00							
QC									
Quality Control									

*AR 4-10-30*

# Picklist Print

Wednesday, September 24, 2014 9:23:47 AM

Page 1

Work Order ID: 124830

**\*124830\***

Parent Item: D412-664-203TRN

**\*D412-664-203TRN\***

Parent Item Name: Crosstube Turning Detail

Start Date: 9/24/2014

Required Date: 9/24/2014

Start Qty: 1.00

Required Qty: 1.00

Comments: IPP Rev:A 08-03-06 new issue DD verified by:eec  
IPP Rev B 08.04.02 Removed polish EC verified by: DD

Component Item ID/ Item Name	Replacement Item ID	Mfg/ Purch	Bin Item	Primary Location	Last Location	Route Seq ID	Unit of Measure	Qty on Hand	Qty per Kit	Total Qty	Qty Issued	Date Issued	Status
D6009-129		Manufactured	No			120	Each	40.5000	1	1			

**\*D6009-129\***

**\*\***

Crosstube Material

<u>Location</u>	<u>Loc Qty</u>	<u>Loc Code</u>
LG003	40.5	
107864	36.5	
75627	3	
75648	1	

1 mm L 14/10/02

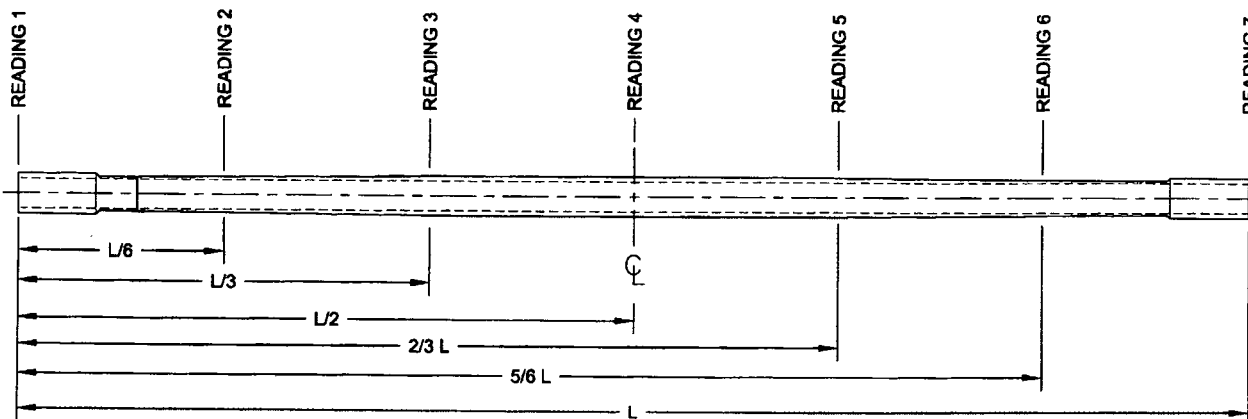
<b>DART AEROSPACE LTD</b>		<b>Work Order:</b>	124830
<b>Description:</b> Crosstube Assembly (412 High Aft)		<b>Part Number:</b>	D412-664-243
<b>Inspection Dwg:</b> D412-664-243 Rev: F		<b>Page 1 of 2</b>	

### FIRST ARTICLE INSPECTION CHECKLIST

Inspection Sheet Drawing Dimension		Tolerance	Actual Dimension	Accept	Reject	Method of Inspection	Comments
SIDE A	2.684	+0.005/-0.000	2.687	✓		vern	CNC-08
	2.748	+0.005/-0.000	2.752	✓			
	2.884	+0.005/-0.000	2.888	✓			
	3.019	+0.005/-0.000	3.023	✓			
	3.163	+0.005/-0.000	3.167	✓			
	3.308	+0.005/-0.000	3.312	✓			
	3.429	+0.005/-0.000	3.434	✓			
	2.990	+0.005/-0.000	2.991	✓			
	2.618	+0.005/-0.000	2.621	✓			
	0.200	+/-0.010	.200	✓		vern	CNC-08
	R0.063	+/-0.010	.063	✓		RG	
	R0.500	+/-0.010	.500	✓		"	
	4.971	+/-0.030	4.970	✓		vern	CNC-08
SIDE B	2.684	+0.005/-0.000	2.690	✓		vern	CNC-08
	2.748	+0.005/-0.000	2.753	✓			
	2.884	+0.005/-0.000	2.888	✓			
	3.019	+0.005/-0.000	3.024	✓			
	3.163	+0.005/-0.000	3.167	✓			
	3.308	+0.005/-0.000	3.313	✓			
	3.429	+0.005/-0.000	3.434	✓			
	2.990	+0.005/-0.000	2.992	✓			
	2.618	+0.005/-0.000	2.622	✓			
	0.200	+/-0.010	.200	✓		vern	CNC-08
	R0.063	+/-0.010	.063	✓		RG	
	R0.500	+/-0.010	.500	✓		"	
	4.971	+/-0.030	4.970	✓		vern	CNC-08
	124.100	+/-0.020	124.100	✓		tape	LG-11

<b>DART AEROSPACE LTD</b>		<b>Work Order:</b> 124 830
<b>Description:</b> Crosstube Assembly (412 High Aft)		<b>Part Number:</b> D412-664-243
<b>Inspection Dwg:</b> D412-664-243 Rev: F		<b>Page 2 of 2</b>

### WALL THICKNESS MEASUREMENT



Location	WALL THICKNESS MEASUREMENT (IN)				Deviation $\Delta w$ (max-min)	TOLERANCE
	w1	w2	w3	w4		
READING 1 L= 0"	.404	.391	.378	.391	.026	0.073"
READING 2 L= 20	.328	.307	.324	.340	.033	
READING 3 L= 42	.501	.499	.502	.502	.003	
READING 4 L= 62	.649	.641	.646	.649	.009	
READING 5 L= 82	.525	.484	.483	.511	.042	
READING 6 L= 104	.341	.315	.312	.332	.029	
READING 7 L= 124	.404	.390	.375	.387	.029	

#### Calibration Result

Actual Block Thickness: .100 - .750

SITESCAN 250 Measured Thickness: .100 - .750

<b>Measured by:</b> <i>mmk</i> <b>Date:</b> 14/10/07	<b>Audited by:</b> <i>TW</i> <b>Date:</b> 14-10-20	<b>Preliminary Approval:</b> <b>Date:</b>
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Rev	Date	Change	Revised by	Approved
A	04.06.16	New Issue (P/O D412-664-203)	KJ/JLM	
B	06.03.09	Dwg Rev updated	KJ/JLM	
C	07.05.08	Tolerance updated for dimension 4.971	KJ/JLM	
D	10.02.02	Dimension 124.100 was 124.09	KJ	
E	12.06.04	Wall thickness form added	KJ	
F	14.06.24	Dwg Rev updated	KJ	<i>[Signature]</i>

Item	Qty -243	Part Number	Description
1	X	D412-664-243	CROSSTUBE ASSEMBLY (412 HIGH AFT)
2	1	D6009-129	CROSSTUBE
3	2	D3595-063-570	RUBBER CUSHION
4	1	D2896-1	SUPPORT
5	2	D3189-1	CHAFING SHIELD
7	4	MS21920-28	CLAMP
8	2	MS21920-30	CLAMP (OR MS21920-32)
9	A/R	SCOTCH-WELD DP460	EPOXY ADHESIVE, 3M SCOTCH-WELD
10	A/R	PROSEAL 890 B-2	SEALANT

#### GENERAL NOTES:

- 1) MATERIAL: MANUFACTURED FROM D6009-129  
FINISHED LENGTH = 124.100±0.020 (BEFORE BENDING)
- 2) FINISH: CHEMICAL CONVERSION COAT PER DART QSI 005 4.1  
PRIME INSIDE AND OUTSIDE PER DART QSI 005 4.2  
MASK UNDERSIDE OF CROSSTUBE AS SHOWN (ZN C6-2, HATCHED AREA)  
PAINT OUTSIDE PER DART QSI 005 4.2  
AFTER PAINTING, REMOVE MASKING AND APPLY MATTE CLEAR COAT
- 3) TOLERANCES: PER DART QSI 018 UNLESS OTHERWISE NOTED.
- 4) UNITS: INCHES UNLESS OTHERWISE NOTED.
- 5) BREAK SHARP EDGES: 0.005 TO 0.010 MAX.
- 6) IDENTIFICATION: DART P/N "D412-664-243" AND B/N ON INSIDE OF CUFF PER QSI 044 6.4 (VIBRATING STYLUS)
- 7) WEIGHT: 47.0 lbs
- 8) PART IS SYMMETRIC ABOUT CENTERLINE.
- 9) EXTREME CARE MUST BE TAKEN TO PROTECT THE OUTSIDE SURFACE OF THE TUBE. THE OUTSIDE SURFACE MUST BE SMOOTH AND FREE FROM SURFACE DEFECTS SUCH AS SCRATCHES, NICKS, OR DENTS. DEFECTS UP TO 0.005" MAY BE BLENDED OUT LONGITUDINALLY. CIRCUMFERENTIAL GRIND MARKS ARE UNACCEPTABLE. DO NOT GRIND TUBE AFTER SHOT PEEN.

#### TURNING

- 10) WHEN TRANSITIONING TO STOCK MAT'L, RUN CUTTER OFF PART. BLEND OUT EDGE LONGITUDINALLY. TRANSITION SHOULD BE SMOOTH.

#### BENDING

- 11) BEND PROGRESSIVELY WITH A MINIMUM OF 8 PASSES. MAXIMUM TUBE FLATTENING DUE TO BENDING IS 7% (BASED ON O.D.) IN LOWER HALF OF R30 BEND AND 6% (BASED ON O.D.) ON REMAINING TUBE.
- 12) LIQUID PENETRANT INSPECT OUTSIDE SURFACE OF CROSSTUBE PER QSI 038. TO BE PERFORMED AFTER FINAL POST-BEND GRINDING. ANY ADDITIONAL GRINDING REQUIRES ANOTHER LPI INSPECTION.

#### ASSEMBLY

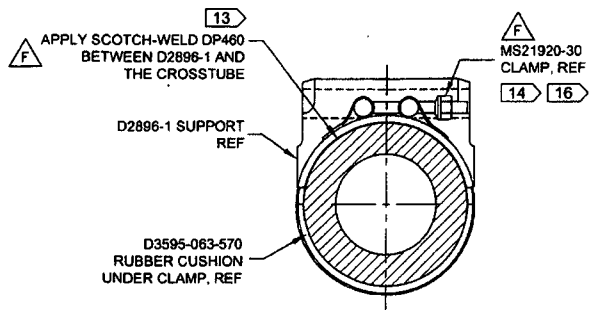
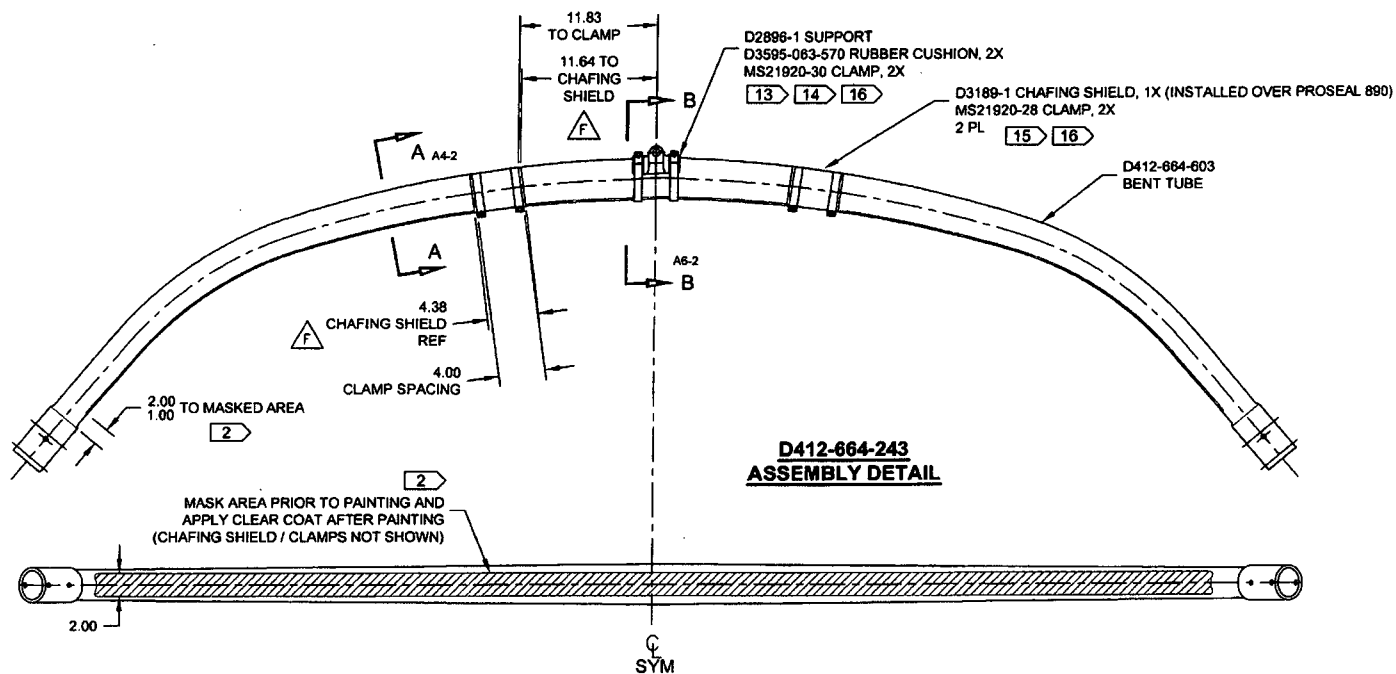
- 13) INSTALL D2896-1 CENTER SUPPORT USING A 0.04" TO 0.07" THICK LAYER OF SCOTCH-WELD DP460 PER QSI 015.
- 14) INSTALL MS21920-30 CLAMPS (OR -32) WITH D3595-063-570 RUBBER CUSHIONS TO SECURE THE D2896-1 SUPPORT ON TOP SIDE OF THE CROSSTUBE. ENSURE CLAMPS ARE ON TOP SIDE OF CROSSTUBE.
- 15) APPLY A THIN COAT OF PROSEAL 890 ON INSIDE CONCAVE SURFACE OF D3189-1 CHAFING SHIELD AND LET CURE PER MANUFACTURER'S INSTRUCTIONS. INSTALL PROSEAL D3189-1 CHAFING SHIELD ONTO CROSSTUBE BY APPLYING A THIN COAT OF PROSEAL 890 ONTO CROSSTUBE. BE SURE TO ELIMINATE ANY AIR GAPS.
- 16) TORQUE CLAMPS ON D2896-1 SUPPORT 80 TO 100 IN-LB. TORQUE CLAMPS ON D3189-1 CHAFING SHIELD 40 TO 50 IN-LB. ENSURE AT LEAST 1.5 THREADS SHOWING IN SAFETY AND THAT NUT HAS NOT BOTTOMED-OUT AFTER TORQUING. PRIOR TO PACKAGING, RE-CHECK TORQUE ON CLAMPS AFTER ADHESIVES HAVE CURED FOR 24 HOURS.

SHOP COPY  
RETURN TO  
ENGINEERING  
UNCONTROLLED COPY  
SUBJECT TO AMENDMENT  
WITHOUT NOTICE  
WORK ORDER  
NO. 124830 MJS  
1409-24

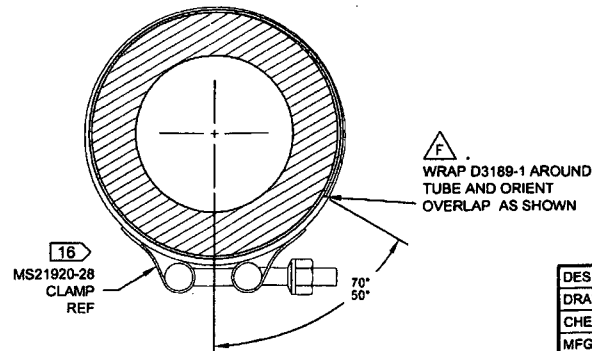
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2014-05-26

F	NOTES RE-ORDERED. SCOTCH-WELD WAS MAGNOBOND (C8-1). ADD CLAMP RETORQUE (A8-1). REMOVE ABRASION STRIP. ADD INSPECTION WINDOW (C8-1). CHAFING SHIELD NOW 4.38 WIDE (C6-2). ADD 7% CRUSHING (B8-1). CHG BEND HEIGHT TOL. TO ±0.25 (C1-3). CHG CUFF TOL. (D2-4). CLAMPS FLIPPED TO PREVENT CHAFING (B7-2, B7-3). INCORP. DEO E-21-4	CP	14.04.01
E	REFORMAT/REVISE GENERAL NOTES. REORGANIZED VIEWS AND REFORMATTED DRAWING TO CURRENT STANDARDS. RELOCATED FLAG #8 PER PAR 08-048 (ZN A8-3); ADD TOLERANCE (ZN B6-3, C4-3, C8-3 & C5-3); MOVED TURNING DETAIL & UPDATED TOLERANCE TO SHEET 4.	RF	09.09.30
D	REMOVE D2732-058, CHANGE TO D3595-063-570	PH	07.03.09
C	REMOVE D2856-600-1087, ADD D2732-058 & MAGNOBOND 6398, MS21920-32 WAS MS21920-30	MB	06.10.27
B	ADD HOLES FOR COMPATABILITY WITH BHT/AA SKIDTUBES	PH	05.02.04
A	NEW ISSUE	PH	01.10.17
REV.	DESCRIPTION	BY	DATE
DESIGN	Q	DART AEROSPACE LTD HAWKESBURY, ONTARIO, CANADA	
DRAWN	Q	DRAWING NO. REV. F D412-664-243 SHEET 1 OF 4	
CHECKED	DW	TITLE SCALE	
MFG. APPR.	RH	CROSSTUBE ASSEMBLY (412 HI AFT) NTS	
APPROVED	SH	COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSE OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.	
DE APPR.	SH	DATE 14.04.01	





**SECTION B-B** D4-2  
SCALE 4X

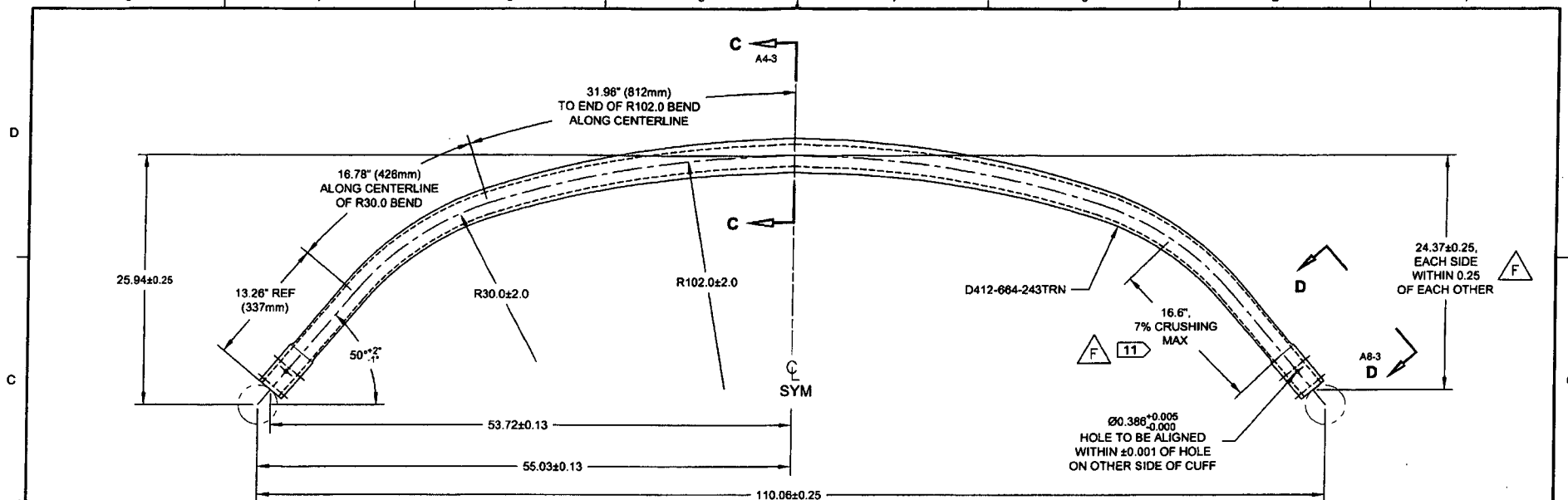


**SECTION A-A** D6-2  
SCALE 6X

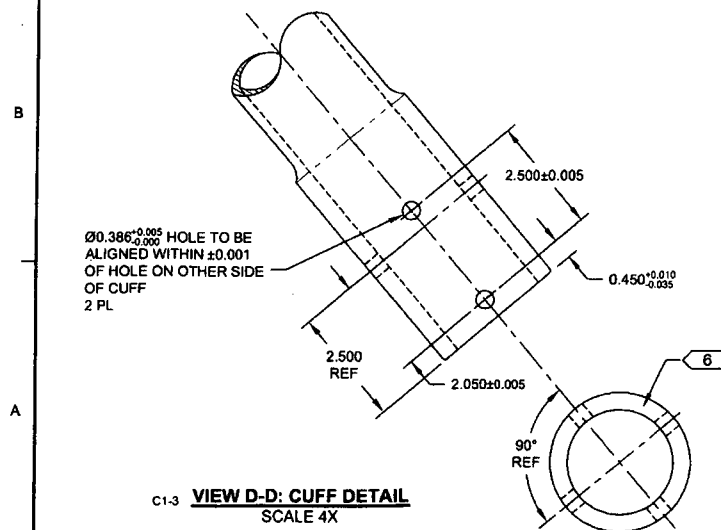
**RELEASED**  
2014-05-26

DESIGN		<b>DART AEROSPACE LTD</b>
DRAWN		HAWKESBURY, ONTARIO, CANADA
CHECKED		DRAWING NO. REV. F
MFG. APPR.		D412-664-243 SHEET 2 OF 4
APPROVED		TITLE SCALE
DE APPR.		CROSSTUBE ASSEMBLY (412 HI AFT) NTS
DATE	14.04.01	COPYRIGHT © 2001 BY DART AEROSPACE LTD
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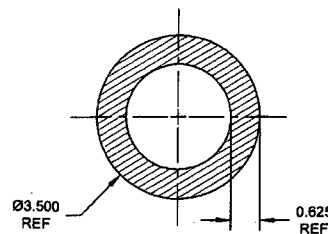
8 7 6 5 4 3 2 1



**D412-664-603**  
**BENDING AND DRILLING DETAIL**



C1-3 **VIEW D-D: CUFF DETAIL**  
SCALE 4X

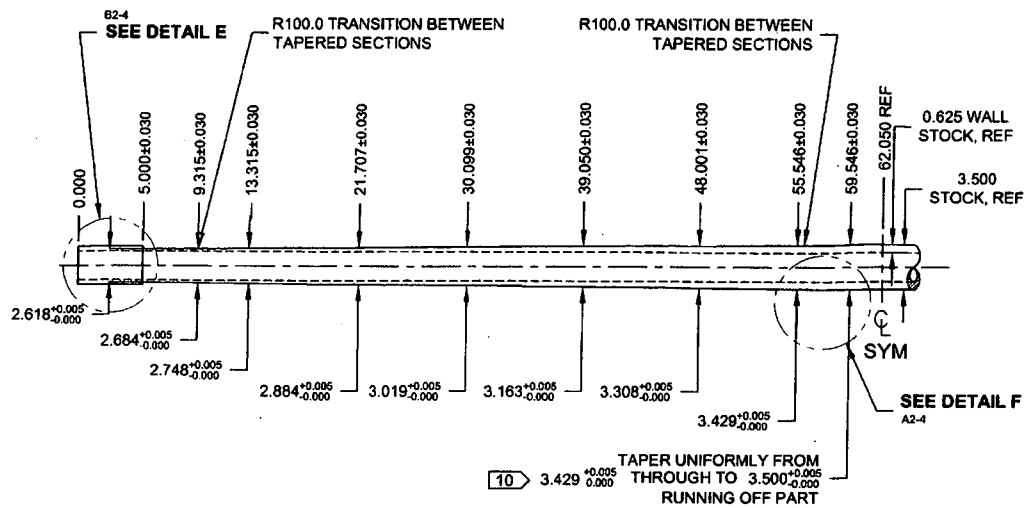


**SECTION C-C** D5-3  
SCALE 4X

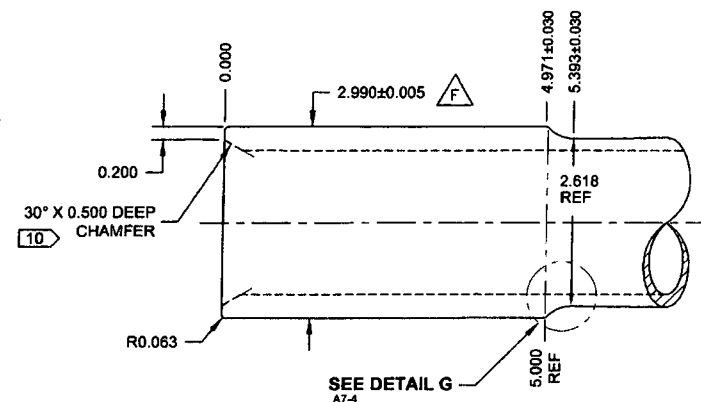
**RELEASED**  
2014-05-26

DESIGN	<i>DP</i>	<b>DART AEROSPACE LTD</b>	
DRAWN	<i>DP</i>	HAWKESBURY, ONTARIO, CANADA	
CHECKED	<i>DW</i>	DRAWING NO.	REV. F
MFG. APPR.	<i>DP</i>	D412-664-243	SHEET 3 OF 4
APPROVED	<i>DP</i>	TITLE	SCALE
DE APPR.	<i>DP</i>	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
DATE	14.04.01	<small>COPYRIGHT © 2001 BY DART AEROSPACE LTD THIS DOCUMENT IS PRIVATE AND CONFIDENTIAL AND IS SUPPLIED ON THE EXPRESS CONDITION THAT IT IS NOT TO BE USED FOR ANY PURPOSES OR COPIED OR COMMUNICATED TO ANY OTHER PERSON WITHOUT WRITTEN PERMISSION FROM DART AEROSPACE LTD.</small>	

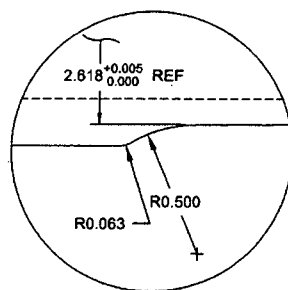
8 7 6 5 4 3 2 1



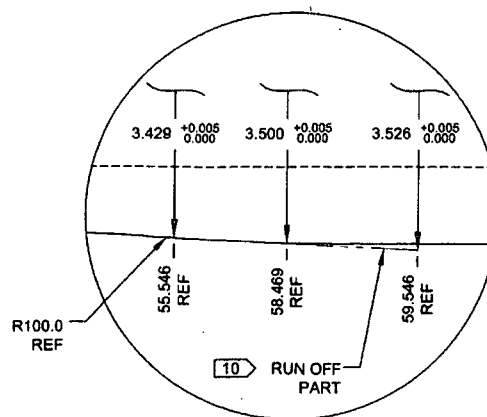
**D412-664-243TRN**  
**TURNING DETAIL**



**DETAIL E:**  
**CROSSTUBE CUFF**  
SCALE 5X



**DETAIL G:**  
**CUFF TRANSITION**  
SCALE 10X



**DETAIL F:**  
**TAPER RUN-OFF**  
NOT TO SCALE

**RELEASED**  
2014-05-26

DESIGN	90	<b>DART AEROSPACE LTD</b>	
DRAWN	90	HAWKESBURY, ONTARIO, CANADA	
CHECKED	DW	DRAWING NO.	REV. F
MFG. APPR.		D412-664-243	SHEET 4 OF 4
APPROVED	AL	TITLE	SCALE
DE APPR.	#	CROSSTUBE ASSEMBLY (412 HI AFT)	NTS
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